

CARNIVOROUS PLANT NEWSLETTER

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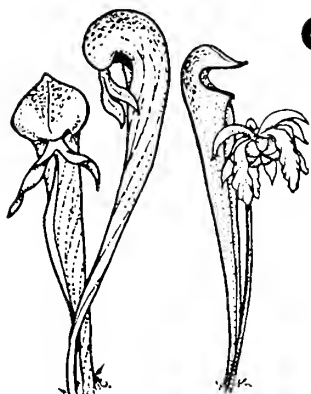
MARCH 1995



CARNIVOROUS PLANT NEWSLETTER

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Front cover: *Byblis gigantea*. Grown and photo by Brian Cochran. This is the "Perth" form, and the plant is only three months old from seed. Note abundant prey.

Rear Cover: *Sarracenia minor*. Pastel and color pencil work by Marcia R. Cohen.

The coeditors of CPN would like everyone to pay particular attention to the following policies regarding your dues to the ICPS.

All Correspondence regarding dues, address changes and missing issues should be sent to ICPS C/O Kevin Snively, P.O. Box 1013, Everett Wa. 98206-1013, U.S.A. or ICPS c/o Fullerton Arboretum, CSUF, Fullerton, CA 92634. DO NOT SEND TO THE COEDITORS. Checks for subscription and reprints should be made payable to ICPS.

All material for publication, comments and general correspondence about your plants, field trips or special noteworthy events relating to CP should be directed to one of the coeditors. We are interested in all news related to carnivorous plants and rely on the membership to supply us with this information so that we can share it with others.

Views expressed in this publication are those of the authors, not necessarily the editorial staff.

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Seen any new growth lately? (a note from the president)

Rick Walker, MS26U4, P.O. Box 10350, Palo Alto, CA 94303

Spring is nearly here in California! I just finished the Sarracenia pre-season clipping and saw a few early flower-orbs starting up - the new pitchers won't be far behind. In the greenhouse, *Drosera peltata* is well on its way, with dewey stalks already 6" tall. Seeing all this new growth, my thoughts turn to the recent ICPS election. I thank everyone for their confidence in electing me president and I promise to do my best in serving the society. I'm looking forward to the next two years with great anticipation.

I gave a detailed description of my vision for the ICPS in the nomination statement, so I won't repeat myself here. Since that time, though, there have been a few developments and the following is a summary of "what's cooking".

Leo and Marybeth Song have transferred the ICPS business office duties to Kevin Snively, our elected Treasurer/Secretary. Leo has been involved with the ICPS from its inception, and Marybeth had been handling our bookkeeping and mail processing. I'm really grateful for the contributions that they've both made to the society. Marybeth will now be focusing on answering children's letters to the ICPS, and is planning to write a children's column for our newsletter. Leo has agreed to continue receiving ICPS inquiries at the Fullerton Arboretum so that we will continue to have a stable mailing address.

Peter D'Amato has promised to write an ongoing column for CPN, starting with the next issue. Peter operates a CP nursery in Northern California, and plans to fill his column with his growing experiences and with interviews of other growers.

Christoph Belanger, our vice president, is looking into ways to expand our membership. This might involve advertising in other horticultural journals, or reaching out to school age kids through CPN-donated educational material. Please send Christoph your ideas on this activity.

There is talk underway about an international CP convention in 1997. One suggested location is Atlanta, Georgia. Any thoughts? Send a note to either me or Ron Gagliardo and we'll make sure your views get considered... Better yet - get involved and help make it happen!

Trent Maixon has expressed an interest in organizing a registry of CP clones, cultivars, and hybrid names. The registry would probably be accessible through the CP on-line database, and would provide a centralized way to maintain records on individual CP clones. We are currently way behind the Orchid and Cactus groups in this area, and our records are getting more complicated by the day. Expect to see an article in an upcoming CPN about this project.

I'm a real believer in participative democracy, and will strive to represent your interests as best I can. Please write to let me know how I can best serve you. You can reach me at:

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News And Views

Tom Kahl, VP PNWCPC (8219 S. 130th Street, Seattle, WA 98178).

Here is a list of upcoming events for the Pacific Northwest Carnivorous Plant Club.

Plant sale at the annual Rhododendron Species Botanical Garden plant sale April 1, 1995. Weyerhaeuser Wy S., Federal Way, WA 98063

Club meeting May 6, 1995 at Andrew Marshall's, 131 SW 185th Normandy Park, WA 98166.

Club meeting July 8, 1995 at Don Graham's, 21206 SE 268th PL. Kent, WA 98042.

Joe Mazrimas (329 Helen Way, Livermore, CA 94550).

The San Francisco Garden show finally showed up this year after a two year suspension and took place August 26-28, 1994. The number of CP (56) entries was pretty good considering the long hiatus. Allan Ber won the Best of Show award with a large specimen of *Pinguicula moranensis*. The Best Australian plant, a pygmy *Drosera roseana*, went to Gary Dughi. The winner of the most awards (7) went to John Rizzi. The participants in this year's show were: Allan Ber, Richard Walker, Gary Dughi, Geoffrey Wong, Suzanne and Calvin Pon, Dan Newman, Gregory Lum, Larry Logoteta, Joe Mazrimas, John Rizzi, and Pamela Brody. A big thanks of appreciation to Tony Rea and others for the great setup and display. As before, we received many comments on the beauty of the plants and their mysterious habits.

Larry Loew, Education/PR Intern (New Carnivorous Plants Display at the Foellinger-Freimann Botanical Conservatory).

Beware insects who visit the Foellinger-Freimann Botanical Conservatory in Fort Wayne Indiana for there are now two dozen carnivorous plants lurking in the hallway just outside the entrance to the Tropical House. The display was unmasked at our Halloween Masquerade Party, October 28, 1994. A 55-gallon aquarium has been converted into a terrarium to house the plants. Venus Fly Traps, Sundews, Butterworts, and Pitcher Plants now inhabit the tank to await hapless insects that drop in to visit the warm lights, and to enchant visitors of all ages that may just happen to see a Fly Trap catch its lunch. We have a variety of species such as *Nepenthes ventricosa*, *Drosera adelae*, *D. aliciae*, *D. capensis*, *D. venusta*, *Pinguicula agnata*, *P. moranensis*, a *Pinguicula* hybrid, *Sarracenia purpurea*, and *Dionaea muscipula*. This display was created after a grant to the Conservatory for such a display. The plants were imported from a nursery called California Carnivores.



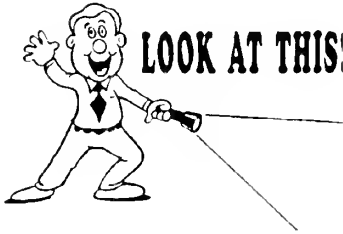
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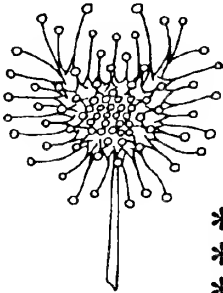
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NEPENTHES DATING & MATING



I'm wondering if anyone is interested in the creation of a *Nepenthes* dating service. The system would allow more species breeding and, hopefully, cut down on all the haphazard hybridizing. If you are interested or have comments, please contact Tom Johnson at (818) 248-1623 or PO Box 12281, Glendale, CA 91224-0981.

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My Experiences in Growing *Byblis gigantea* from Seed

Brian Cochran, P.O. Box 62128, Virginia Beach, VA 23466-2128

A little about myself before I begin...I have been growing carnivorous plants since about 1978. During that time, through my moves across the country, my CP collection has ranged from somewhat impressive to embarrassing (you know, when the collection dwindles to one sundew and a Venus Flytrap you bought at Kmart.)

Anyhow, I was one of the (I suppose) few, who back in the very early 80's, managed to get a *Byblis gigantea* started from seed. One lone plant started via the fire technique out of about 100 seeds. There wasn't a lot of cultural information around at the time and after about a year the plant died. In retrospect, it was probably due to keeping it too wet and in too much humidity.

Now here is why I wrote this article...

In 1993, a friend of mine, Ron Gagliardo, gave me the name of another seed source in Australia — Allen Lowrie. If you've never seen Allen's catalog, order it. It's incredible.

He not only sells seeds for different forms of *Byblis gigantea*, but also for other rare carnivorous plants such as *Drosophyllum*, *D. Regia*, and many tuberous sundews (for which he also sells mature tubers.) Anyhow, back to the story...

I immediately purchased some *Byblis gigantea* seeds.

After receiving the seeds, I began to read up on all methods of starting them. I couldn't believe the discrepancies and vague descriptions on methodologies. One source said do not cover them, another said cover with 4 cm. of soil. One suggested boiling water, one the fire technique. One mentioned leaving the seeds on the soil to become moist before firing them up while another simply said scatter on the surface and ignite paper or hay over them. I was confused and all the more determined.

First, I'd like to say — the fire technique does work! But it seems to be a dice throw. You could burn the seeds too much or not enough. Lose them if you pick out any ashes. And it usually takes over a month before you even know if you have been successful.

The method I use is based on seed treatment with the plant hormone — gibberellic acid. Kindly suggested to me by Allen Lowrie.

Now this technique had apparently been around for some time and I wondered why these plants were not showing up in a lot of collections. I was soon to find out. Even though the gibberellic acid was germinating the *byblis* seeds like crazy (something I had never seen before), they were dying as soon as they sprouted, damping-off.

Nothing new here...but after several tries I discovered something...

No matter how sterile the sand/peat mixture seemed to be (like baking it two days in a row and then soaking it with a fungicide) the little seedlings were still being attacked by damping-off disease! And if I had not been looking at the soil surface with a 5x magnifying glass, I would not have even known I was getting any germination, since the seedlings were turning black almost as soon as they were emerging from the seed coat.

However, just as a matter of experiment, I had pushed a couple of seeds down into a pot of moist milled sphagnum moss — sold by Mosser Lee under the brand name "No Damp Off." As I was about to give up and had by now practically run out of seeds I noticed two green shoots in the moss. *Byblis giganteas*! About a week later I moved the seedlings (even before they had shed their seed coats) into a very open sand/perlite/peat mixture. They are now about a year old, and nearly 18" tall.

I repeated the procedure and had two more plants about a month later!

So after many failed attempts to start *Byblis giganteas* — I believe I have hit on a reasonably reliable method and I offer it to all interested in this wonderful plant!

I will number each step and follow with brief comments and particulars. And yes, it was just dumb luck.

Oh, by the way, I did this in my home under lights and I have never had to wait any longer than 2 weeks for germination!!! And after 3-4 months, I grew them outside all summer alongside the *sarracenia*s in my collection. These are tough plants.

Interested? Please read on. I call this a suggested technique since I am sure there are dozens

of other ways to get around the damping-off problem. The following is mine...

(reader's note: This article was delayed a little going to print, so I have added some second year refinements to this technique (marked 2nd year update.)

Suggested Technique for Starting *Byblis gigantea*

(Best time to start is early winter indoors (about 60 F) — afterwards moving plants outdoors after danger of frost is past.)

1) Purchase some good quality *Byblis gigantea* seeds!



Figure 1. Brian Cochran's setup for starting *Byblis* seeds and growing seedlings (See article in this issue).



Figure 2. *Byblis gigantea* "perth", seven months old plant from seed and already in flower. Note "annual stem" forming in center.

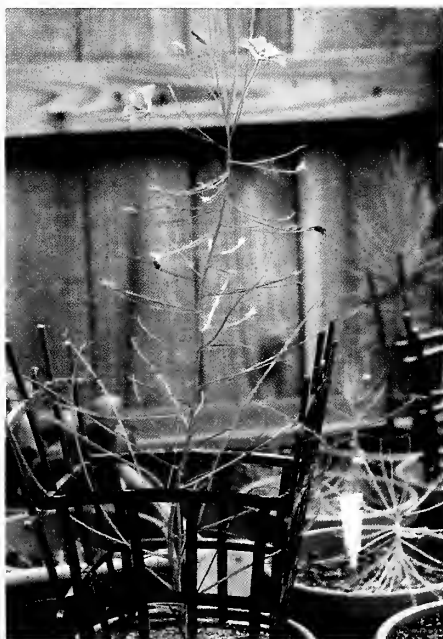


Figure 3. *Byblis gigantea* "Cataby", ten months old, late summer. Note different .

You don't have to buy massive quantities of *Byblis gigantea* seeds. With this method, one or two packs will do. I have gotten three plants from as few as eight seeds!

2) Prepare a 4" plastic pot using pure milled sphagnum moss. Mosser Lee sells this under the brand name "No Damp-off." The moss should be evenly damp but not soaked. Mist surface with a fungicide as an added precaution. Cover with a well-ventilated clear plastic cup or bag.

I prepare this first so that if any surface fungus appears in a day or two I can hit it again with a fungicide.

When you cover the pot with the clear plastic, cut rather large holes in it at the top. You shouldn't be getting any condensation on the sides!

3) Mix 250mg gibberellic acid/ 200ml distilled water and let stand for 24 hours.

Use only powdered gibberellic acid (GA3) which can be purchased from botanical supply companies.

Do not use premixed gibberellic Acid. I did and got nothing. A friend told me they are all too weak to work or have other ingredients harmful to the seeds.

The ratio of gibb acid to water came from the formula 1 gram of gibb acid to 1 litre of water. Since you do not need that much solution you can divide the gibberellic acid into 1/4 grams using a gram scale.

If you notice I use only 200ml of water. It makes the solution slightly stronger and the seeds germinate a little quicker!

Finally, I found by letting it set for 24 hours assures complete dissolving of the gibb acid into water. You will get more seeds germinating if you do this!

4) Soak *Byblis gigantea* seeds for 24 hrs. in this solution.

This is self explanatory. Don't cheat. Let them soak for a full 24 hours.

5) Plant seeds in pre-prepared milled sphagnum by pushing them slightly down into the moss until only their tops show. Mist surface with chinisol or other appropriate fungicide. Replace the vented cover over top to restrict evaporation and put in bright place (i.e. within 4-6" of two 40watt fluorescent lights.)

I usually mist the surface with the fungicide first so I am not washing off any of the gibb acid. Pushing the seeds only down slightly into the moss still allows you to see them.

You should not be getting any condensation on the plastic cover. If so it's probably a little too humid for the seeds.

It is especially important to keep the moss just damp! However, the natural anti-fungal nature of sphagnum will keep damping-off to a minimum. Check daily. If it starts to dry. Water from the bottom, but only enough to make it damp again.

If any fungus or mold appears on the moss surface during the next couple of weeks just mist lightly with a fungicide. I have not found this to be much of a problem though.

(2nd year update: I dripped Truban around the seedlings if any fungus appeared. Just a couple of drops followed by a couple of drops of pure distilled water. It seemed to be far more effective than Chinisol. Be careful though, Truban is extremely poisonous!!!)

6) After about 10-14 days, look for and expect germination daily! Use a 5x or 10x magnifying glass. The germinating plants will at first look like little white specks appearing on the seeds. Daily they will grow visibly longer. Don't disturb them just yet.

Also you may continue to get germination over the next month or so. But start looking after 10 -14 days!

7) Let seed sprouts continue to grow for about 7-14 days.

What you're looking for is the sprouts to start getting some color to them (green or red.) This means they are starting to harden off and becoming more resistant to damping-off. Take note — these are excruciatingly slow germinators. Be prepared to wait almost a month before they begin to produce true leaves. After that they grow extremely fast. Doubling in size nearly every couple weeks!

Anyhow, they don't even have to shed their seed coats or straighten up before proceeding to the next step! None of mine ever did.

(2nd year update: I left some of the seedlings go almost 3 weeks in the moss. More of them survived the transplant to soil.)

8) Prepare a 1/3 sand/ 1/3 perlite/ 1/3 peat mixture that is open and just barely moist. Using a 6" pot mound the mixture a little in the middle. **The important thing is just to have the soil barely moist — if it is wet the seedlings will be attacked by fungus.**

If you err when preparing this mixture let it be on the side of the sand and perlite. The Eneabba form of *Byblis gigantea* grows on pure white silica sand in nature. This is not your typical sand/peat mixture. It's probably best described as an open gritty mixture like *Drosophyllum* enjoysexcept a little more damp.

9) Remove germinating seeds (again this is after 7-14 days) from moss with the tip of a knife or other similar instrument and place gently in a small indentation on the sand/perlite/peat mixture. Drip a couple of drops of fungicide around it with an eyedropper.

It does not matter if some of the moss is still attached to the seedling. The beauty of the milled sphagnum is that it almost falls away from the seedling. If you can get rid of it do so. Also, be careful. These young seedlings can have roots nearly 1/2" to 1" into the moss by now!!!

After placing the young seedling into the sand mixture what you are trying to do is simply nudge the sand against the emerging seedling. If you push too hard you will bruise it and the seedling is sure to be attacked by fungus!

By dripping the fungicide about 1/4" away from the base of the seedling, it helps to move any sand particles a little closer to it — helping it to settle.

The main thing here is not to have the sand too wet! In fact, mine is just barely moist. And after I plant the seedling in, I water from the bottom until absorption slows down. After a day, the surface will look just moist.

As the seedling begins to form it's customary dew, I even let the surface look dry before I water again.

These seedlings don't need ultra high humidity or soil moisture. In fact, both seem to be their greatest enemy.

(2nd year update: I dripped a couple of drops of Truban (fungicide) around the transplanted seedlings followed again by a couple of drops of distilled water to settle them in. Then I sprinkled some DRY milled sphagnum (same stuff I used to germinate the seedlings) just around the base of the seedling after I transplanted it. (easily done with the tip of a knife.) This dry surface plus the fungicide must have helped because I only lost one seedling and that was because the pot dried out!)

10) Cover with a vented clear plastic lid. The seedling will continue to grow and can be left in this pot for its lifespan.

I use 6" deep dish clear plastic trays. These can be trimmed to make a custom fit terrarium-like lid. But I also cut plenty of holes in it to allow for greater air circulation. Remove the lid after the seedling begins to grow through the top (about 3" tall.)

Enjoy them! These are hardy plants and can stand anywhere from light frost to over 100 F. The trick seems to be to only give them enough water in the tray to be sucked up within a minute or so. Never stand them in water! They should be flowering in about 6 months time. (June in Northern hemisphere)

For adult plants:

FULL SUN!!! KEEP ONLY SLIGHTLY MOIST!!! TOP OF SOIL SHOULD USUALLY LOOK DRY!!!

I am sure there are some growers thinking that all of this is a bit tedious and others that find fire the best method. But this method has worked for me (twice!) One thing I know is that these plants are extremely rare in the United States, yet are not particularly hard to grow if you are careful about watering.

Since the real trick is getting them started, it is here that I will continue to work to improve the success rates.

Finally, a disclaimer, you will most probably lose a number of germinating seeds even with this method. I lost about 50% of mine, but compared to a 0% success rate over the last 16 years it is a definite improvement. Also, a lot of the germinating seeds will simply refuse to root and will expire on the moss. Do not worry. The healthy ones will almost always make it!

So crack open a Foster's if you get a *Byblis gigantea* going. You deserve it.

(2nd year update: I had a 90% success rate moving them to soil. So I had a second Foster's!)

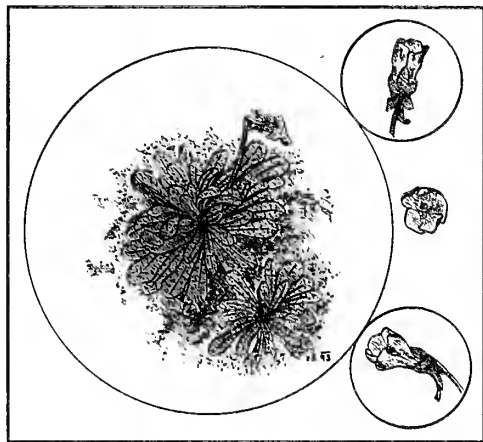


Figure 1. *Pinguicula rotundifolia* in flower, and vegetatively budded secondary plant.
Drawings by author.

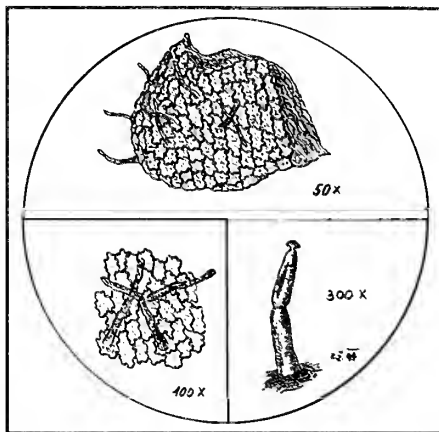


Figure 2. Leaf surface studies of *P. rotundifolia*.

GROWING CP IN THE CZECH REPUBLIC III: *Pinguicula rotundifolia*

Zdenek Zacek (Ustavni 139, P8,
Bohnice, 18100
Czech Republic)

This installment, I would like to discuss another Mexican pinguicula, *P. rotundifolia*.

I have been growing this plant for about two years in a glass case in my study and I can say it has responded nicely. The species is cultivated in a 1:1 mix of perlite and peat. The pot is placed in a saucer but water is not allowed to stand in the saucer especially in winter. It seems much better to spray the winter leaves during the winter with pure water.

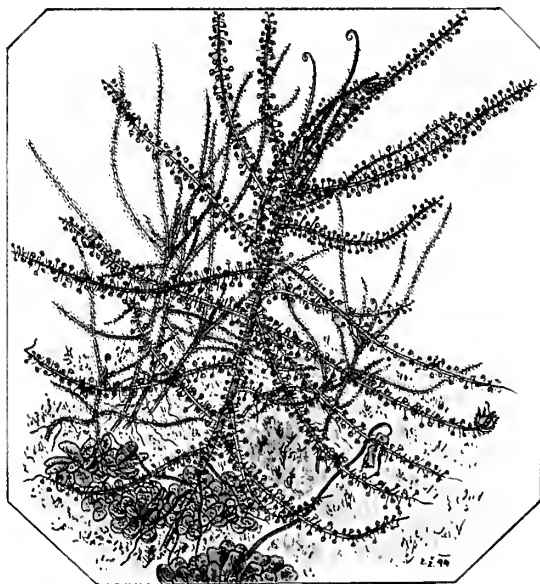


Figure 3. A "stray" *Byblis liniflora* in the pot with *P. rotundifolia*.

Figure 1 shows the plant in flower (10 Oct 1993), and you can also see clear evidence of vegetative reproduction. This occurs spontaneously and often.

I have never observed more than one flower per plant at any one time. My plants flower in all seasons except winter. As is the case with many *Pinguicula* spp. the corolla persists for a few days only while the remainder of the flower, including the glabrous or almost glabrous peduncle, persists for several weeks.

The leaves exhibit no movement since trapping is passive. Glands seem fewer on the leaf surfaces compared to other pinguiculas. Also, fewer prey seem to be trapped compared to other pinguiculas in my collection. Figure 2 shows three leaf studies using my field microscope.

Early in the spring of 1994 I noticed an unexpected germination of *Byblis liniflora* in a pot with *P. rotundifolia*. I decided to leave it there to see if the two species could co-exist, and as Figure 3 indicates, they certainly seem able to do so.

***DROSERA FILIFORMIS* Raf.: ONE SPECIES OR TWO?**

Don Schnell, Rt. 1, Box 145C, Pulaski, VA 24301

INTRODUCTION: THE PROBLEM --

We are all quite familiar with the two expressions of *Drosera filiformis* Raf. The familiar northern plant has leaves 8-25 cm long with prominent red glands and occasional red leaf pigment, is known from coastal plain sandy wet areas with its main distribution running from Long Island through New Jersey, although the plant is found as far north as Maine and Massachusetts, and as far south as a few locations I know of in Columbus and Brunswick Counties, North Carolina, and disjunct populations on the shores of some lime sinkhole lakes in Bay County, Florida. There have been reports of the plant in South Carolina, but there are no supporting herbarium sheets and it has not been seen in more recent surveys. The interesting disjunct populations in Bay County, Florida are a separate problem to be tackled in a later article.

The well-known southern expression of thread-leaf sundew has leaves about 25-35 cm long and these are entirely green. The plant seems restricted to the Gulf coastal regions. I am not aware of any northern colonies, although I suppose one day someone will come across an anthocyanin-free form of the northern plant!

The problem seems to be what to call these things. The northern thread-leaf sundews are variously called *D. filiformis*, *D. filiformis* var. *typica* and *D. filiformis* var. *filiformis*. The southern Gulf coastal green plants are either *D. filiformis* var. *tracyi* or *D. tracyi*. The confusion boils down to two main factors: 1) Whether the northern and southern thread-leaf sundews are separate species or sub specific variations of one species, and 2) Changes in the ICBN while this problem has been argued.

It is worthwhile looking at some of the history of the thread-leaf sundew(s) in North America, but I am afraid that will not provide all the answers and one or two aspects are a mystery.

Drosera filiformis was described botanically by the colorful field botanist Constantine Samuel Rafinesque (1783-1840) in 1808 (Med. Repos. NY. 5:360) and he listed the plant as a North American boreal, and it had red glands, so it is clearly the northern expression. Nearly a century later, we come to questionable aspect number one.

Diels (1906) in the Droseraceae issue of Das Pflanzenreich listed and described *D. filiformis* Raf., then made a formal botanical description with specimen history of var. *tracyi* under the species. The type specimen for this was one collected by J.M. Macfarlane near Ocean Springs, Mississippi, and he was listed with several additional specimens. After the epithet var. *tracyi*, Diels placed the following Latin phrase in parentheses: (Macfarlane msc. sub titulo speciei). The problem is, what does this mean? Particularly, what is “msc.” an abbreviation for? The rest of the phrase is straight forward, and if we make an assumption that “msc.” is the equivalent of the more modern “ms.” for manuscript, then the phrase is “Macfarlane in manuscript under the title species”. This would mean that Macfarlane intended to describe the plant as a species, had a manuscript in preparation or prepared but not published, and Diels scooped him by describing a varietas, but giving a polite nod to Macfarlane in the process! Another possibility was suggested in correspondence to me by Ms.P.M. Eckel, namely that Diels might have meant for “Msc.” to be an abbreviation for miscellus, or “mixed”, possibly alluding then to a number of mixed plants of various origin on a single herbarium sheet, both northern and southern plants.

I am inclined at this point to go with the first, the “manuscript” interpretation. Unfortunately, Msc. is not a Latin abbreviation that I or anyone I have queried can find. It is unlikely that Macfarlane had a mixed northern/southern herbarium sheet since the type used by Diels from Macfarlane’s collection at Ocean Springs would most likely have only the Gulf coastal plants. Then, if Macfarlane did have a species description manuscript, what happened to it?

I think I can safely say it was not published, not even in relatively obscure venues such as *Bartonia* or the occasional papers from the University of Pennsylvania Botany Department. Maybe in 1906 he sighed, buried the manuscript, and decided to go with Diels’ variety. Academic botany was probably no less political then as now, and Macfarlane had been tapped to do the Sarraceniaceae for Das Pflanzenreich, which appeared two years later in 1908. But Macfarlane was also a proud, stubborn man (Edgar Wherry in personal correspondence to me), and perhaps he did not bend and there is a published manuscript somewhere after all.

So, where does the combination *D. tracyi* as a species come from? We see it listed in various publications today and some flora writers seem to prefer it. The usual attribution for it is Macfarlane in L. H. Bailey’s *Standard Cyclopedia of Horticulture*, 1914 edition. I referred to my copy of that work, and sure enough on p1077 is listed *D. Tracyi* Macfarlane. There follows a few lines of English horticultural description. Macfarlane did the entire treatment for sundews for this horticultural work. What is there is certainly not by any stretch an adequate “botanical publication” of a new species combination, even in those days, so one would think then that *D. tracyi* is *actually a nomen nudum-illegitimate*. That is, unless something else happened between 1906 and 1914 of which we are not aware. Considering the searching that I and others have done in CP literature in general, until someone comes forth with an acceptable botanical publication of *D. tracyi* by Macfarlane, I am inclined to regard the combination as illegitimate. To mention a few, though certainly not all, botanists who have recommended *D. tracyi*, Shinners(1962) gave a line or two of garbled reasoning I cannot follow, and Godfrey and Wooten(1981) also prefer the combination. I do not know if either they or others have looked into or evaluated the purported “description” in Bailey(1914).

The next information is in a 1944 paper by Wynne. Many CPN readers have referred to this paper which is well done. She mentions that Macfarlane proposed” the species *D. tracyi* in 1914 in Bailey, indicating that she did not accept his paragraph on this as publication, but then she lists it in the synonymy of the southern plants. She explained that she preferred Diels’

var. *tracyi* because of the very minor differences between the northern and southern plants, and made the combination var. *typica* to cover the northern plants. However, ICBN rules indicate that if a sub specific plant is described, the plants of the type of the species automatically bear the same epithet for a sub specific name. Thus, the northern plants are more properly var. *filiformis* if the southern plants are var. *tracyi*.

In summary for this first section, the only acceptable names at present for the two expressions of *D. filiformis* are var. *filiformis* and var. *tracyi*. *D. tracyi* is a nomen nudum, and someone would have to properly publish this if they wished to designate it a species. Which brings us back to our original question: Are we dealing with one or two species?

SOME OBSERVATIONS--

Considering the morphology of the plants, Wynne(1944) noted that aside from color and leaf length, there were no differences between the northern and southern plants of sufficient discontinuity to warrant separate species designation. I concur after examining many plants over the years. Early on, I thought there might be a useful difference in the anther lobes of the stamens. If you examine these with magnification, you will see that each anther is two-lobed. These seemed to be quite separate and parallel in the red plants, but joined into an inverted V in the green plants. After examining still more plants in different seasons and locations, I concluded that while most red plants had two-lobed anthers, and most green plants had inverted joined V anther lobes, there were too many exceptions (about 20%) in each case and I now discount this.

Let us consider seed morphology in our subject plants as well as North American *droseras* as a group. Wood (1966) agrees with the value of this and feels that seed morphology is useful in distinguishing species worldwide. With a dissecting microscope, one can appreciate seed size, shape and surface sculpturing. Wynne(1944) did the definitive seed work on the North American species and provided a nice chart of seed drawings in her paper, and these are also available in Britton and Brown(Gleason, 1952). have found these seed morphologies to be quite useful, accurate and consistent. The useful point here is that the seeds of the red plants and the green plants of *D. filiformis* are identical among a gallery of quite easily distinguished seeds. Wynne (1944) also noted this, and we have another point in favor of one species.

Another useful tool to help us would be to look at some simple hybrid studies. While hybrids among North American *Drosera* spp. are easy to produce and are often found in nature where the species are sympatric, all resultant hybrids of the North American species (and indeed, most in the world) are sterile; that is, not capable of further sexual reproduction (Wood, 1955, 1960; personal observations). So an examination of some aspects of hybrid plants between our red and green expressions may be helpful.

Pursuing this line was made easier by the fact that more than a decade ago, Joe Mazrimas produced a hybrid between these two expressions and it was published as a horticultural cultivar in CPN (Robinson, 1981). This cultivar was named *Drosera filiformis* (California g.) 'California Sunset', and I will refer to it informally as "Sunset". Readers will recall that there are differences between naming and publishing hybrids botanically as a group, and publishing a hybrid as a cultivar. The cultivar is selected as an index plant among all the initial cross progeny as the best example, then propagated vegetatively to avoid variation attendant to sexual reproduction. All the other original hybrid progeny are destroyed.

Joe was kind enough to furnish freshly collected pollen and seedpods(which he normally would destroy!) for my little study. first did a stain of pollen collected from

the red and green plants, and "Sunset". I used lactol phenol cotton blue and noted 90-95% stainability of both the red and green plant pollen, and 80- 85% stainability in "Sunset" pollen. This indicates that all three pollens were quite viable, the hybrid only slightly less so. As a control, I stained pollens from hybrids of widely accepted species, e. q. *D. filiformis* x *intermedia*, and found less than 5% stainability, indicating non-viable pollen. If the pollen viability indication of the accepted sterile hybrids of recognized species of *droseras* is so low, and the "Sunset" hybrid pollen viability so high, then this would seem to be another point in favor of one species.

But let's go one step further in simple experiments that anyone can do. Let's see what is in those mature "seedpods" of "Sunset" that Joe so kindly sent me. Opening them and examining the contents under the dissecting microscope, I noted abundant full seed identical to that pictured by Wynne (1944). For the final proof of non-sterility of the cultivar hybrid, I sowed the seed and had better than 90% germination, after which I destroyed the seedlings, of course! This would then indicate that the hybrid "Sunset" is a hybrid between less than species since hybrids of all the other accepted, clear-cut species are sterile.

IN CONCLUSION...--

These results provide support for the concept of the red northern and the green southern expressions of *D. filiformis* being sub specific rather than separate species. I personally accept the variety designations rather than a concept of separate species.

As an aside, one might ask why use variety instead of subspecies. Briefly— and you may wish to consult standard references for more detailed discussions of this— variety (or more properly *varietas*) is an older more established botanical concept. Surprisingly, the designation "subspecies" did not come into play very much at all until the turn of the century, and then it was more or less suppressed by classical botanists, and those who would be recognized by these folks! More modern systematists cautiously consider a different sub specific system supported by Western American botanists that there be a hierarchy of slots beneath species, the highest of these levels being subspecies (preferably these are geographically separate one from the other), then varieties under subspecies, and forms under varieties. Strictly under this system, you cannot have a variety unless there is 3 subspecies in which it is included. But in our *D. filiformis* varieties we have no subspecies overhead. Ideally, then, the two varieties might best serve us by being changed to subspecies. However, you cannot simply say "Okay, let's call them that then. " Since this is a matter of preference and interpretation, you would have to— you guessed it—publish the new levels in the formal botanical sense. Many would say it makes little difference and do not waste the trees making paper to do this.

ACKNOWLEDGMENTS--

I would like to thank Joe Mazrimas for sharing his material of 'California Sunset' with me, and Ms. P. M. Eckel of the Buffalo Museum of Science for entering into discussion of Latin translation.

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ANNOUNCEMENT

Phil Sheridan and Bill Scholl are pleased to announce they will be hosting the fourth annual eastern CP meeting from June 2 - 4, 1995 and invite you to attend. The convention will be held at their botanical preserves in rural Caroline County near Fredericksburg, Virginia. These properties contain some of the best *Sarracenia* exhibits and wetland habitats in the region.

We would like to solicit individuals for poster sessions and talks. Poster sessions involve creating a display of your research or special subject for general viewing and discussion. Poster sessions and talks will be held at the Sheridan residence.

Most of the daylight hours in past CP meetings have been spent in prepared talks and we would like to save these presentations for the evening. In this manner more time can be spent examining and discussing the extensive plant collections and natural areas of the area.

We have a limited number of free rooms for individuals to stay in and unlimited primitive camping. The area has a number of hotels in a 6 - 20 mile radius for those seeking more private quarters.

We request a registration fee of \$20.00 by May 15, 1995 which should cover meals, refreshments and registration packet. Those experiencing financial or transportation problems are invited to contact one of the hosts for assistance. We do ask for volunteers to help with cooking and cleanup. We look forward to seeing you in June.

Your Hosts:

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Biology Dept.
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Richmond, VA 23284
W (804) 828-1562
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Bill Scholl
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Southeastern CP Meeting Planned.....

Mark your calendars for the up coming Southeastern CP meeting hosted by Larry Mellichamp at UNC Charlotte. Lot of things are planned for this 2nd annual meeting. This year there will be a field trip to a local bog, talks on all CP's, and a plant swap and auction. As in the last year we will have a Friday night gathering to get to know the attendees. The meeting is set in Charlotte, NC on September 22, 23, and 24, 1995. All are invited and more will be mailed at a later date to the southeast area. If you wish to attend or help with this meeting please contact Larry Mellichamp at UNC Charlotte, DEPT. OF BIOLOGY, Charlotte, NC 28223 or Steve Baker, Rt. 1, Box 540-19AB, Conover, NC 28613, 704-256-7035. Hope to see you there.

Literature Review

Cipollini, D.F., et. al. 1994. Total carbohydrates in nectar of *Sarracenia purpurea* L. (Northern pitcher plant). *Am. Midl. Nat.* 131:374-377.

The authors used a novel paper wick method to collect nectar from three pitcher sites in both young and older pitchers, the sites being the hood, rolled margin of the mouth and the ala. The method consisted of using 3 x 10 mm points of filter paper clipped to the plants by plastic covered clips. Initially, careful examination was done to rule out damage to plant hairs which would have contaminated the collections. The strips were left in place until saturated, extracted with water and analyzed chemically using an acid anthrone method. Results indicated that the rolled mouths of younger pitchers consistently had high levels of carbohydrates, hoods inconsistently far less, and the ala none. Carbohydrates were markedly decreased to absent in older pitcher nectar.

Higashi, S., et. al. 1993. Analysis of feeding mechanism in a pitcher of *Nepenthes hybrida*. *J. Plant Res.* 106:47-54.

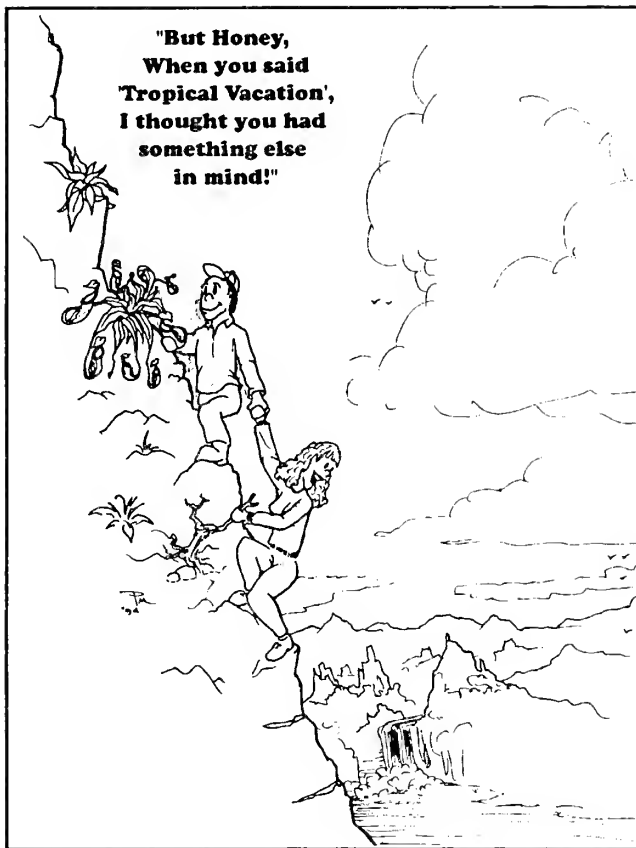
The authors concluded that in this particular taxon, digestion was accomplished by both bacterial enzymes and native proteases. With the pitcher fluid initially at an alkaline or near neutral pH, feeding resulted in bacterial enzyme activity at the neutral or higher pH, in turn releasing ammonium ions from the digesting prey which stimulated lining cells in the pitcher to produce hydrogen ions, thereby lowering the pH. At this lower pH, native plant proteases took over to complete digestion.

Turner, B. L. 1994. Two new gypsophilic species of *Pinguicula* (Lentibulariaceae) from Nuevo Leon, Mexico. *Phytologia* 76:69-72.

The new specks of Mexican pinguiculas roll on! These are gypsophilic, from southern Nuevo Leon and are closely related to *P. esseriana*. They are both delicate annuals. *P. jorgehintonii* has a more regular corolla than *P. esseriana* as well as shorter, glabrous pedicels, and shorter glabrous spurs. A drawing of this taxon is in the article. *P. hintoniorum* is similar to above, but the flower is more strongly zygomorphic with a deep purple color, shorter tube and somewhat longer spur.

Wilson, P. 1994. The east-facing flowers of *Drosera tracyi*. *Am. Midl. Nat.* 131:366-369.

The author notes that the dowers of *D. tracyi* (*D. filiformis* var. *tracyi*) generally face east or toward the direction of the rising sun. They do not follow the sun during the day. The flowers open at 0800 and close around noon at the study site in the Florida panhandle in May. The author manipulated several flowers to face west (sunset) in the predawn hours before opening, then counted pollen grains in anthers and stigmas in flowers collected at noon to note pollen removal and depostion respectively. He concluded that the facing of the flower had no effect on anther pollen removal and stigma pollen deposition and that presumably pollinators were active in flowers facing either way so that the adaptation was no longer required. This reviewer has one question: Considering that the flowers were collected to be analyzed at noon during or after closing, how does the author account for the usual habit of North American droseras to self-pollinate, if not insect-pollinated earlier, at closure? He apparently did not observe for pollinators during the test morning, or at least enumerate them, so a possible insect pollinator benefit has not been ruled out.

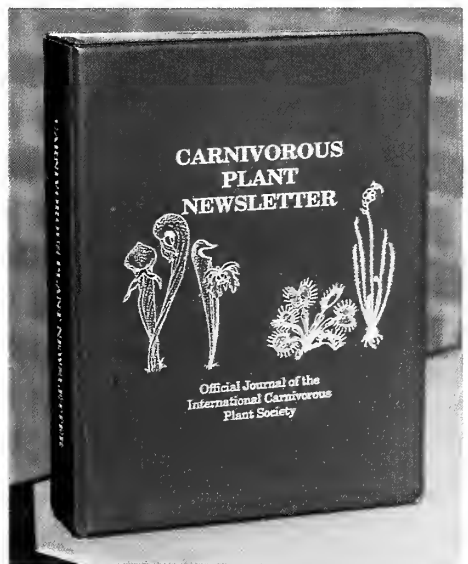


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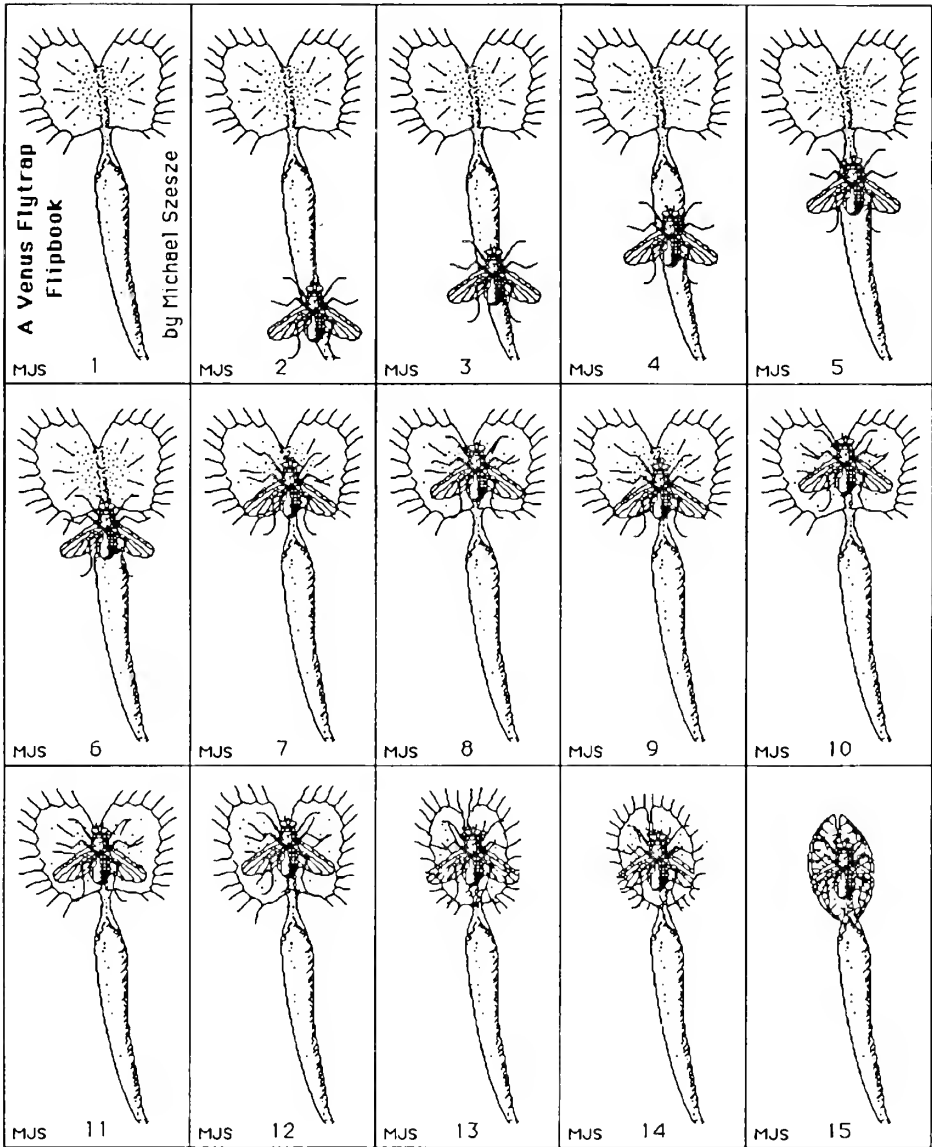
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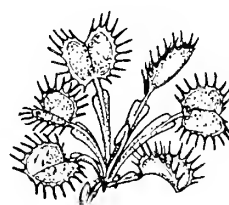
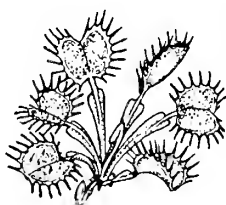
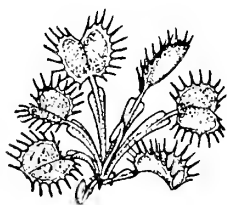
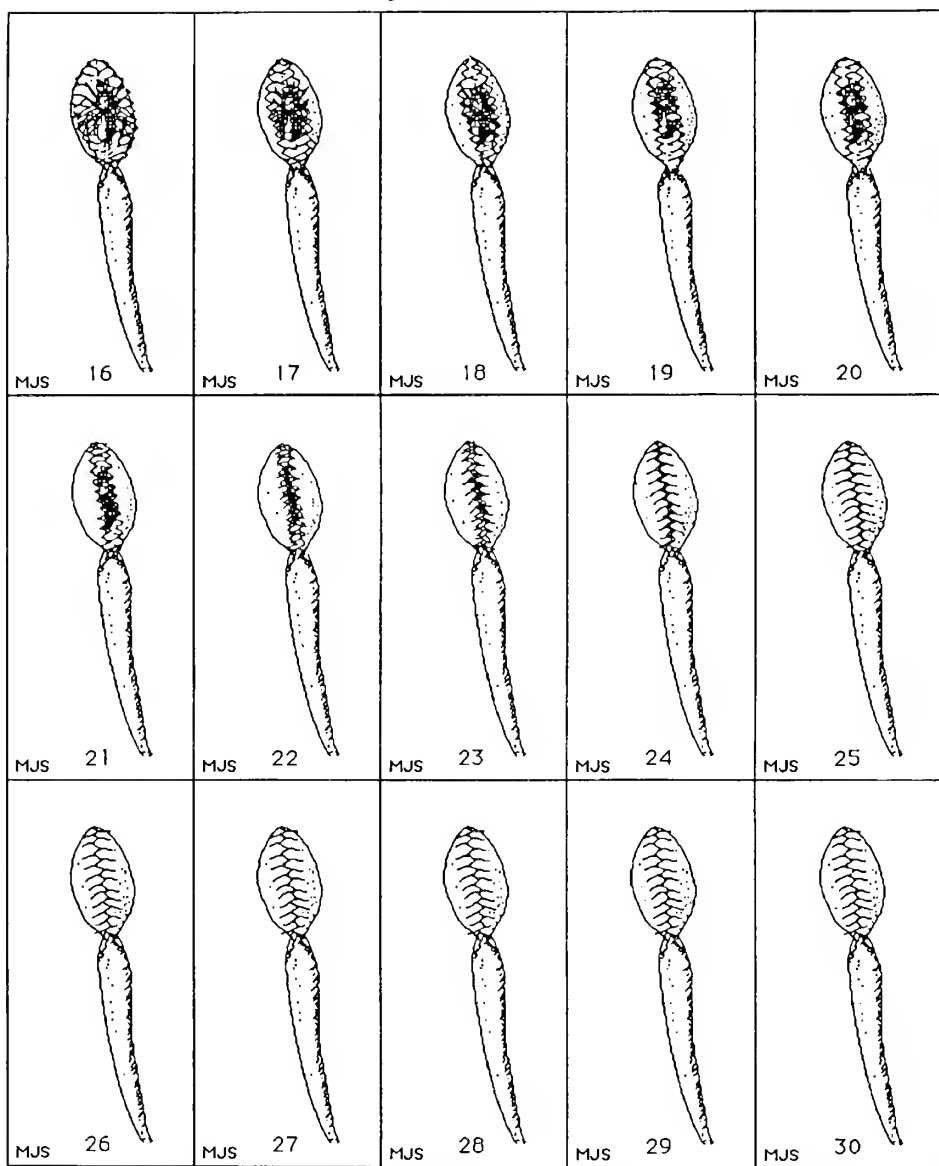
A Venus Flytrap Flipbook
by Michael Szesze



Michael Szesze (3431 Bayside Forest Court, Huntington, MD 20639)

Michael is a teacher who has assembled a "Teacher's Guide to Carnivorous Plants" which is in its second edition. Among the instructional and fun activities within is this *Dionaea* flipbook. So you won't damage your CPN, copy this page and the following page and enlarge up to 11" x 14" while doing so. Cut out the pages, assemble in order and staple along one short margin. Then flip the pages at varying speeds and watch the flytrap catch prey.

A Venus Flytrap Flipbook
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 S. flava Fitzgerald GA
 S. flava veined Fitzgerald GA
 S. flava Irwin Cty GA
 S. flava heavy veined (5)
 S. flava purple throat
 S. leucophylla
 S. leucophylla Gulf Breeze, FL
 S. minor Oculo GA
 S. minor, Ben Hill Cty GA
 S. minor Irwin Cty, GA
 S. minor Fitzgerald GA
 S. oreophila
 S. oreophila all green
 S. psittacina Fitzgerald GA
 S. psittacina Oculo GA
 S. purpurea
 S. purpurea purpurea
 S. purp venosa, Mtn Bog Form
 S. purp venosa v. burkei
 S. rubra
 S. rubra gulfensis
 S. X alata X leuco
 S. X alata X minor
 S. X (alata X psit) X alata (5)
 S. flava X purp X flava X self
 S. flava X purp (5)
 S. X (leuco X rubra) X ?
 S. X (leu X fla) X (leu X rub)
 S. leu X (fla X leu)
 S. minor X psit nat'l hybrid
 Fitzgerald GA
 S. minor X oreophila (5)
 S. X mitchelliana (5)
 S. (purp X ala) X (fla X leu)
 D. aliciae
 D. adela (3)
 D. anglica Norway (5)
 D. auriculata (5)
 D. auriculata NZ (7)
 D. binata Haraki Plain NZ
 D. binata North Plains, NZ
 D. brevifolia (4)
 D. burkeana (10)
 D. burmannii
 D. burmannii Berwah, QLD (6)
 D. callisto (1)
 D. capensis
 D. capensis 'alba'

D. capensis 'Narrow Leaf'
 D. capensis Long leaf (3)
 D. capensis red (2)
 D. capillaris (4)
 D. capillaris "long Leaf" (5)
 D. capillaris pk flr (2)
 D. coccicaulis
 D. dielsiana (13)
 D. ericksonae (5)
 D. filiformis filiformis NJ Pine Barrens
 D. filiformis filiformis
 D. fili fil X CA Sunset (3)
 D. glanduligera (1993 seed)
 D. intermedia
 D. intermedia Czechia (10)
 D. intermedia 'Carolina Giant'
 D. intermedia Giant
 D. intermedia Cuba (10)
 D. intermedia Tropical (8)
 D. intermedia Brazil (7)
 D. intermedia "Brunswick, N.C."
 D. intermedia 'Pine Barrens' (10)
 D. macrantha macrantha
 D. montana pk flwr (2)
 D. natalensis (10)
 D. natalensis red flwr (10)
 D. nitidula ssp. omissa (2)
 D. peltata grn rosette Molgoa, NSW (8)
 D. peltata Kandos Area
 D. planchonii
 D. rotundifolia
 D. rotundifolia Bloomsburg, PA
 D. rotundifolia 'Haines, AL' (12)
 D. rotundifolia Oregon
 D. rotundifolia Thomas Lake, WA
 D. sessifolia (5)
 D. sp. botswana (3)
 D. sp Cuba (2)
 D. spatulata (9)
 D. spatulata Kanto (5)
 D. spatulata 'North Island', NZ (2)
 D. spatulata rotundate (2)
 D. spatulata Hairy Sepals, Gympie Qld (5)
 D. spatulata Aichi Pref, Japan (4)
 D. sp. 'Magaliesburg' (1)
 D. trinervia
 D. whitakeri
 D. X dielsiana X sp. transvaal (3)

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POLLINATION OF HELIAMPHORAS

Don Schnell, Rt. 1, Box 145C, Pulaski, VA 24301

Far more people are growing *Heliamphora* spp. than fifteen years ago. Since I am getting more mail requests for information on pollinating and producing seed from these plants, I thought it might be useful to update the procedure from earlier comments in CPN.

It seems worthwhile to comment on floral observations in nature. An excellent summary article on this, based on actual observations and not suppositions, is by Susanne S. Renner (1989). She spent 20 days during February atop Cerro de la Neblina observing *H. tatei*. There have been numerous comments by those exploring the tops of tepuis about the lack of insect life. Several observers have suggested that birds, particularly hummingbirds, may be heliamphora pollinators. However, Renner observed that the flowers are odorless and produce no nectar, so this is unlikely.

While relatively few in numbers with an average of only ten flower visits a day, Renner observed euglossine bees including bumblebees and carpenter bees, visiting the flowers on rounds. These and other bees were trapped with the aid of a special bee bait for identification and enumeration. Clearly, if observations are carried out long enough for a dedicated period during the day over a number of days, one can note these potential pollinators atop tepuis.

More to the point, the bees "buzzed" the flowers as they visited them. This is an activity carried out by bees when visiting certain flowers. They vibrate their wings, eliciting a buzzing sound to us, and in the process cause pollen to be released by the anthers. Unfortunately, heliamphora anthers, similar to many other species of plants, do not burst open and shed pollen. Instead, pollen is released through tiny pores at the ends of the anthers upon vibratory stimulus, such as bee "buzzing". *Heliamphora* anthers do not have true pores but have functional ones instead. SEM photos in Renner's paper show little slits at the end of each of the four anther chambers that behave as pores with pollen release via these openings.

Another feature of heliamphora flowers which we observed long ago and has been confirmed by Renner is that they are protogynous. This is another feature that is common among other plants and it means that the stigma of the pistil (pollen receptive and seed producing organ of the flower) is receptive to pollen before pollen is mature in the anthers in a particular flower. When the anthers finally can shed mature pollen, the stigma of that one flower is no longer receptive. But since there are other flowers in the plant community, mature anthers and receptive stigmas occur simultaneously among many plants, the feature thus encourages cross-pollination. But I have also observed that flowers on the same plant can be crosspollinated so one need not have several plants of different strains available in flower at one time. Since heliamphoras usually have more than one flower per stalk, and perhaps more than one flower stalk per plant, we have an opportunity to pollinate flowers and produce seed from the plants we grow.

If you will observe a cycle of a single flower on your plant, you will note that near the center is a very fine, short green stalk-like structure protruding slightly above the surrounding rosette of cigarshaped anthers. This protruding structure is the style of the pistil with the very small sticky pollen

receptive stigma at its tip. You will observe that within a scant 2-3 days, this stigma tip turns from green to brown, indicating that it is drying and therefore no longer pollen receptive. We will, therefore, write this flower off for seed production. But we will use the anthers for pollen.

In a few days when the next flower opens on your stalk, or on another plant, you must act quickly. As soon as the tepals (petal-like structures) are fully spread, you must pollinate before you lose the stigma. Remove several anthers from the first flower and holding five or six of them between thumb and forefinger, gently pull them open with the thumb and forefinger of the other hand. If you gently tap or rub the torn open ends of the anthers on another fingertip, you will observe a very small quantity of yellow-white dust-like pollen. You do not need much.

Gently tap your pollen covered fingertip on the just opened, sticky stigma of the second flower, touching the stigma in the process. If you are in doubt and want to experiment, also touch or dab the open ends of your anthers on this stigma, but do not overdo stigma contact or you may damage it.

Basically, that is all there is to it. You simply continue on with this process as succeeding flowers open on your stalk or between multiple stalks, using the anthers of older flowers for pollen sources for fresh stigmas. If you have access to tuning forks of varying frequencies, you may wish to experiment by touching the base of the vibrating tuning fork to a group of mature anthers in situ to see if you can mimic and find the right frequency used by bees when they "buzz" the flower. Seedpods will mature in 6-12 weeks. The base of the pistil (the ovary) should begin enlarging within a week or ten days of pollination, indicating successful fertilization.

As the ovary (now a seedpod) matures, it will finally change from pure green to a dryish looking brown green, and then begin splitting open at the seams, as it were. You want to clip it from the stalk before it opens completely and sheds your seed all over the place. The seed may then be sown on whatever CP seed media you prefer. Germination does not require preceding stratification.

There have been several notes in various CP bulletins and meetings about *Heliamphora* hybrids which have been successfully produced since these species are apparently as easily hybridized as *Sarracenia* spp. I would be cautious of flooding the CP world with too many real or claimed hybrids at this point. Oftentimes, the differences among many *Heliamphora* spp. are quite subtle, especially in the juvenile plants CP growers trade among themselves. This could result in a naming nightmare where many growers will never be quite sure what species or hybrids they have.

LITERATURE CITED—

Renner, S. S. 1989. Floral biological observations on *Heliamphora tatei* (Sarraceniaceae) and other plants from Cerro de la Neblina in Venezuela. *Pl. Syst. Evol.* 163:21-29.

Schnell, D.E. 1974. More about the sunshine pitchers. *Garden Journal* 24:146-147. (First description of pollination in cultivated plants with instructions and photos.)

The 1995 CP Sources

Note: All individuals or organizations selling, trading, or buying CP are advised to be cognizant of certain restrictions under the U.S.

ESA and international CITES for certain species (see editorial. CPN 12(1):3, 1983).

Name and Address	Catalog Price	Stock
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California Carnivores 7020 Trenton-Healdsburg Road Forestville, CA 95436	free with S.A.S.E. grower's guide \$2.00	Dionaea, <i>Drosera</i> , <i>Sarracenia</i> <i>Utricularia</i> , <i>Pinguicula</i> , <i>Nepenthes</i> , books, soil mixes
Carolina Exotic Gardens Rt. 5, Box 283-A Greenville, NC 27834 USA	\$1.00	Darlingtonia, <i>Dionaea</i> , <i>Drosera</i> , <i>Pinguicula</i> <i>Sarracenia</i> , live moss
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D. Crump's Carnivorous Plants 4174 Welling Ave. Charlotte, NC 28208 USA	Free with S.A.S.E.	<i>Dionaea</i> , <i>Sarracenia</i> , <i>Drosera</i> Live sphagnum moss
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Heldon Nurseries Ashbourne Road Spath Uttoxeter ST145AD ENGLAND	Inquire	
Hinode-Kadan Nursery 2735 Nakanogo, Hacijyot Hachihyo-Island Tokyo 100 -16 Japan	International reply coupon	Byblis, <i>Cephalotus</i> <i>Drosera</i> , <i>Pinguicula</i> <i>Nepenthes</i> , <i>Utricularia</i>
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Orgel's Orchids Box K-6, 18950 SW 136th St. Miami, FL 33187 USA 305/233-7168	Free	Byblis, Dionaea, Drosera Nepenthes, Pinguicula, Utricularia
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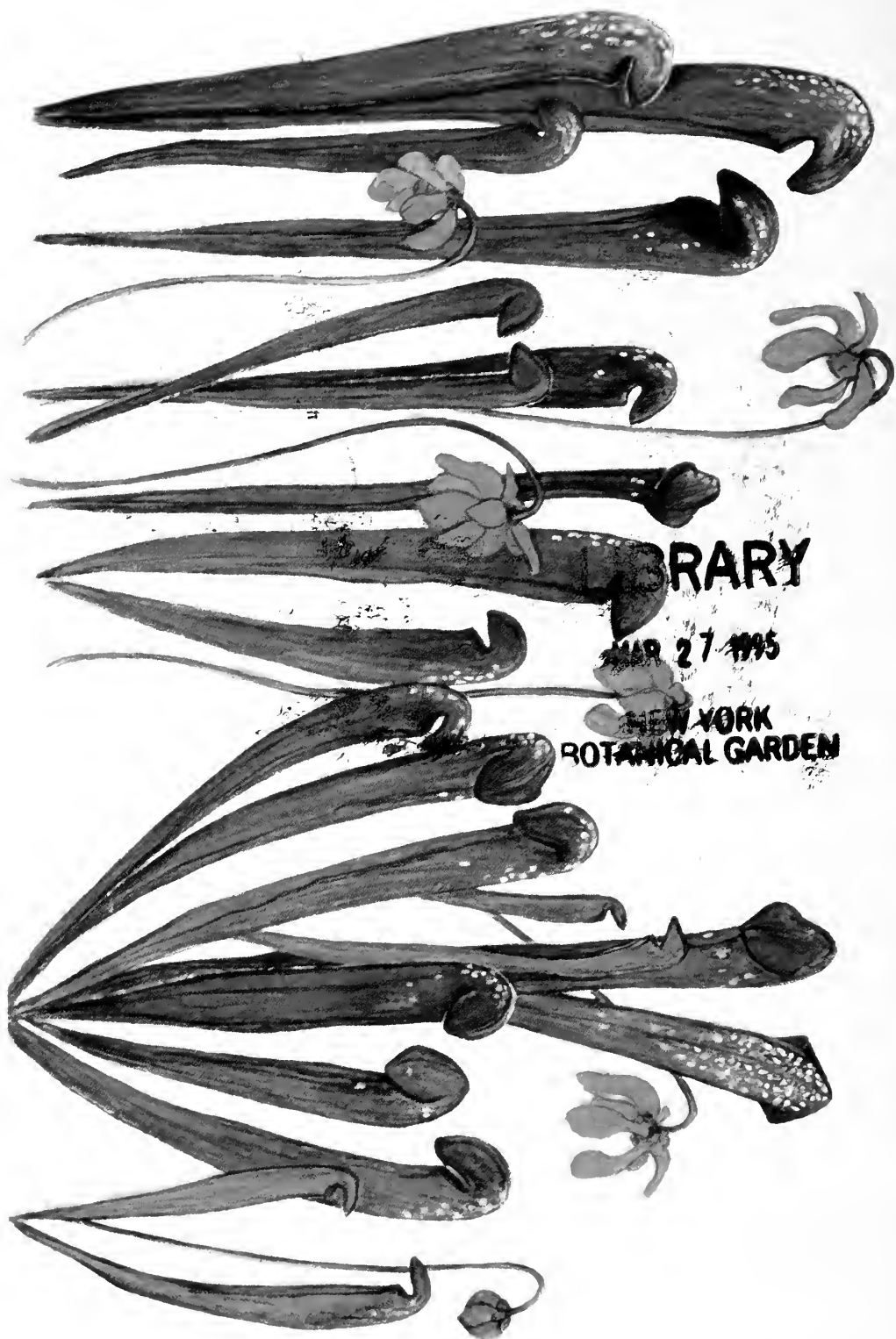
The 1995 List Of CP Books

Not available through CPN. Order directly from publisher, your local bookshop or C.P. Nursery.

1. Animals & Plants that Trap by Phillip Goldstein. Holiday, 1974; Holiday House, Inc.: 18 E. 53rd St.; New York, NY 10022. \$5.95.
2. Carnivorous Plants by Gordon Cheers. Globe Press. Melbourn. (ISBN 0- 9591937-0-7) \$9.95
3. Carnivorous Plants by Francis E. Lloyd. Peter Smith; 6 Lexington Ave., Magnolia, MA 01930; USA. 1942 ed. Paper \$7.95. (ISBN 0-486-23321-9)
4. Carnivorous Plants by Randall Schwartz. Avon Books, 1975; 959 Eighth Ave.; New York, NY 10019; USA. Soft cover \$1.25 (ISBN 0-275-51580-X)
5. Carnivorous Plants by Adrian Slack-. MIT Press, 1979; 28 Carleton St.; Cambridge, MA 02142; USA. 1984 paper \$13.95. (ISBN 0-262-69089-6)
6. Carnivorous Plants by John F. Waters. Franklin Watt, Inc., 1974; 845 Third Ave.; New York, NY 10022; USA. \$4.90.
7. Carnivorous Plants by Cynthia Overbeck. Lerner Publications, 1982 241 First Ave.; Minneapolis, MN 55401; USA. Paperback \$5.95. (ISBN 0-8225-9535-4))
8. Carnivorous Plants by Paul Temple. 1988. A Wisley Handbook. Royal Horticultural Society, London. Available in US for \$5.95 from Sterling Publishing Co., 387 Park Ave. S.; New York NY 10016-8810. (ISBN 0-304-30045-6)
9. Carnivorous Plants of Australia. Vol. 1 & 11 by Allen Lowrie. West Australia Univ. Press, 1986; Nedlands, WA 60009; AUSTRALIA. Or: Intenational Specialized Books; 5602 NE Hassalo St.; Portland, OR 97213; USA. 800/547-7743. \$32.50; hardback \$45.00. Plus \$2.25 UPS. (ISBN 0-85564-254-8)
10. Carnivorous Plants of California by J.Hawkeye Rondeau, PhD. 1991. \$15.95 +postage from author (37 Sunnyslope Avenue, San Jose CA 95127; USA. Tel. 408/929-6529.)
11. Carnivorous Plants of the World by J. & P. Pietropaolo. Timber, 1986. Peter Pauls Nurseries; Canandaigua, NY 14424; USA. \$30.30. (ISBN 0-88192-066-5)
12. Common Marsh, Underwater & Floating Leaved Plants of the United States & Canada by Neil Hotchkiss. 1972.
13. CP of the US & Canada by D. E. Schnell. John F. Blair, Publisher, 1976. 1406 Plaza Dr., SW; Winston-Salem, NC 27103. 1976 ed. \$9.50 + shipping. (ISBN 0-910244-90-1)
14. Cultivating Carnivorous Plants by Allen Swenson. Doubleday & Co., 1977; Garden City, NY 11535; USA. \$7.95. (ISBN 0-385-11148-7)
15. Insect-Eating Plants by L.&G.Poole, T.Y.Crowell, 1963; 666 Fifth Ave.; New York, NY 10016; USA. \$4.50
16. Insect-Eating Plants and How to Grow Them by Adrian Slack. 1986. (ISBN 0-295-96637-8).
17. Insectivorous Plants by Charles Darwin. AMS Press, 1893; 56 E. 13th St. New York, NY 10003; USA; Vol. 12, 1972. \$42.50. (ISBN 0-404-08412-5)
18. Nepenthes of Mt. Kinabalu (in English) by S. Kurata. Sabah National Park. Marston Exotics (see #15 for address). £7.50 (\$12.53 approx.) includes P&H.
19. Pitcher Plants by Carol Lerner. William Morrow & Co.; New York. \$12.95. (ISBN 0-688-01717-7)
20. Pitcher Plants of Peninsular Malaysia & Singapore by Roger G. Shivas. \$10.50. (ISBN 9-971-954-16-8)
21. Plants of Prey in Australia by Rica Erickson. Univ. of W. A. Press, 1986
22. Plants That Eat Animals by J. H. Prince. Lodestar Bks.; 2 Park Ave.; New York, NY 10016; USA; 1979 ed. \$8.95.
23. The Carnivorous Plants by B. E. Juniper, R. J. Robins and D. M. Joel. Academic Press, Book Market Dept., 1250 Sixth Ave., San Diego, CA 92101. Tel. 1-314-528-8110. \$161.00. (ISBN 0-12-392170-8)
24. The Genus Utricularia, a taxonomic monograph, KEW Bulletin, Series XIV, Royal Botanical Gardens. \$68.00. (ISBN 0-11-250046-3) HMSO Publication Center, P.O. Box 276, London SW8 5DT, ENGLAND.
25. Carnivorous Plants Care and Cultivation. 1990. Marcel Lecoufle. Blandford (Villiers House, 41/47 Strand, London WC2N 5JE). US Dist., Sterling Publishing Co. Inc., 387 Park Ave. South, New York; NY 10016-8810. English version. (ISBN 0-7137-2185-5). \$29.00
26. A Guide to the Carnivorous Plants of the World. 1992. Gordon Cheers. Use VISA/MC/AE cardnumber to simplify money exchange.** This book is also avaiable from Discount Garden at 800-327-1828 for \$17.98**

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